Data Sheet

EH-MC23

AIoT Module Datasheet

BLE 5.3

HVIN: EH-MC23, EH-MC23B

Feb 2025 Ver 1.0

Professional *AIoT* Solution Provider

Note：
Check the link or QR code to make sure that you use the latest version of this document:
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1、Module Overview

1.1 Features

ITEM	SPECIFICATION
Microcontroller	ARM Cortex-M0+ CPU (Maximum 48MHz) • SRAM:36kB/64KB • Serial Flash:512KB • ROM:12KB
Standards	• BLE 5.3
BLE Radio	Tx Power • -20dBm to +7dBm Rx Sensitivity • 125kbps:-102dBm • 1Mbps:-96.5dBm • 2Mbps:-92dBm Active Tx Power • RX mode:5.3mA • Active TX mode:5.1mA@0dBm • Active TX mode:<11.0mA@7dBm • Deep LPS：<710nA • Power Down:165nA
Power Consumption	Deep LPS: 1.0uA(with 16K RAM retention,32KHz RC)
Peripherals	22 x GPIO(mux'ed) 1 x SPI(master or slave) 1 x I2C(master) 1 x UART 4 x Timers 8 x µDMA 1 x Watchdog Timer
Voltage	Input power supply:1.71V~3.8V, 3.3V (Typical)
Environmental	Temperature: • Operating temperature: -40°C ~ 85°C • Storage temperature: -40°C ~125°C humidness： • Relative humidity: < 90% Non-condensing • Storage humidity: < 90% Non-condensing
Physical Dimension	Size: 18 x 12 x 2.2 mm 13.7 x 12 x 2.2mm Weight: 0.85g Pin foot: 27-pin Antenna: PCB Antenna/ External antenna

1.2 Description

The EH-MC23 is a Bluetooth 5.3 low - power 2.4GHz multi-application module. It combines the excellent performance of the leading RF transceiver with a low - power ARM Cortex - M0+ 48MHz processor, a power management unit, an ADC, and an intelligent I/O allocation controller. Notably, the EH - MC23 module exhibits outstanding ultra - low - power performance.

This chip integrates a high - performance MCU with a speed of up to 48MHz, as well as DMA, GPIO, SPI, UART, timer, and watchdog functions. It also supports a 32MHz external crystal and integrates a multi - purpose 12 - bit ADC with up to 12 channels. In addition, the EH - MC23 integrates on - chip 36K/48K SRAM and supports user - defined IDE on - chip system development, with SFLASH MCU and JTAG software upgrade functions.

The EH - MC23 operates in a host - less mode and can run the Bluetooth stack and applications without an external MCU. It can also be used as a BLE transceiver in a hosted (HCI) mode through the UART interface (AT commands) with an external host running the Bluetooth stack and applications. This module supports Apple Find My Network and Google Find My Device positioning services. It has passed strict regulatory compliance tests and has been certified by FCC, CE, IC, SRRC, meeting the environmental requirements of RoHS and WEEE directives.

Model Name	RAM	Flash	Antenna
EH-MC23	36K	512KB	PCB
EH-MC23-M	64K	512KB	PCB
EH-MC23B	36K	512KB	External
EH-MC23B-M	64K	512KB	External

Table 1: EH-MC23 Series comparison

1.3 Applications

- Find My Network (Apple)
- Smart Home
- Beacon
- Smart Building
- Smart Hardware
- Electronic Tag
- Remote Control
- Industrial Automation
- Smart Toys
- Mesh

Contents

2、Block Diagram

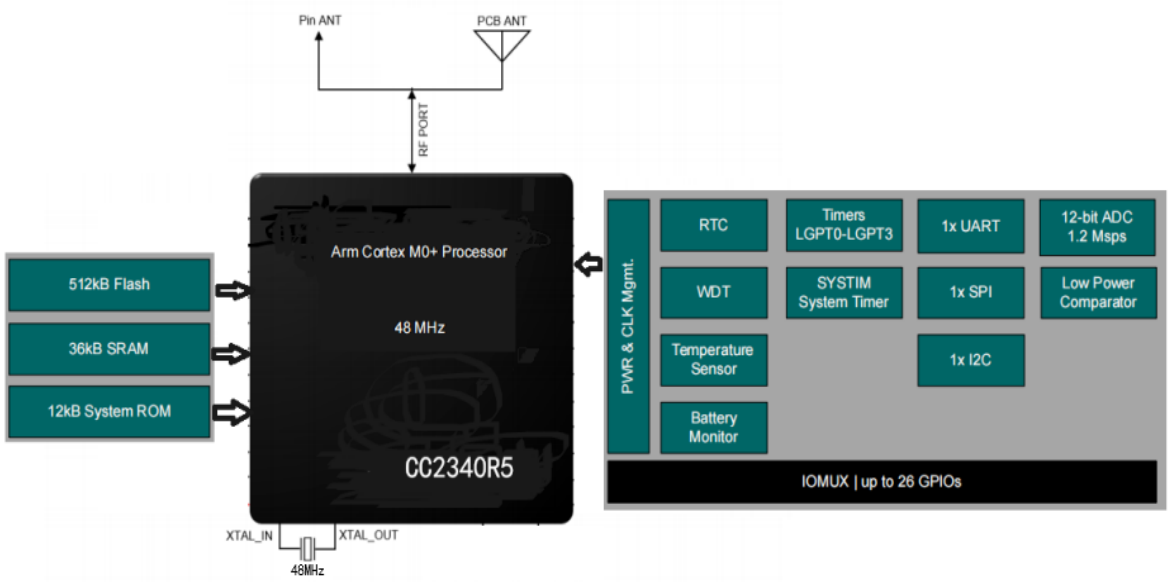


Figure1：Block Digram

3、Pin Definitions

3.1 Pin Map

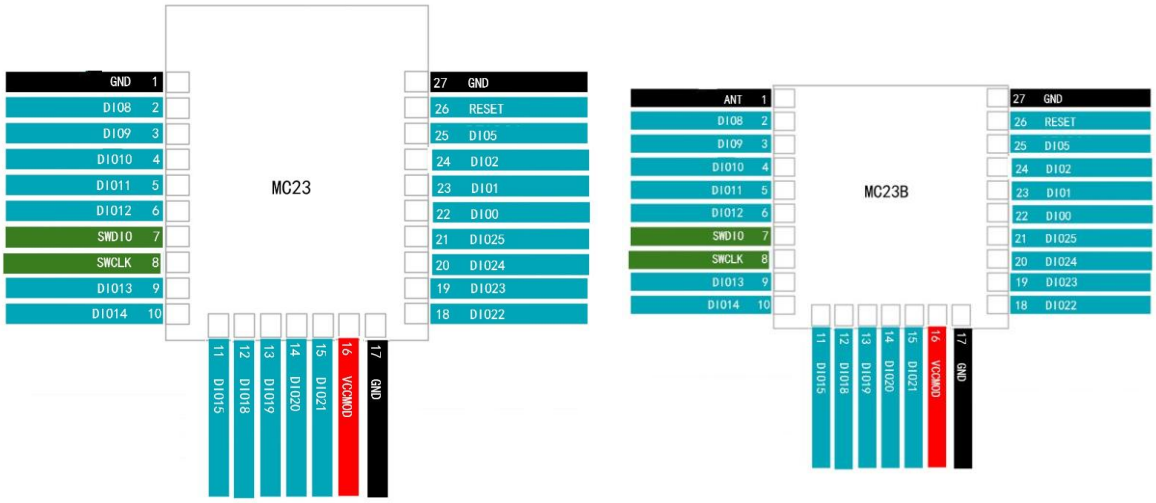


Figure2：EH-MC23 and EH-MC23B Pin Map

3.2 Pin Definition

Pin	Pin Name	Type	Power Domain	Description
1	GND/ANT（MC23B）	-	-	Ground/ANT（MC23B）
2	DIO8	DIO	PWR	Digital GPIO
3	DIO9	DIO	PWR	Digital GPIO
4	DIO10	DIO	PWR	Digital GPIO
5	DIO11	DIO	PWR	Digital GPIO
6	DIO12	DIO	PWR	Digital GPIO
7	SWDIO	DIO	PWR	SWDIO
8	SWCLK	DIO	PWR	SWCLK
9	DIO13	DIO	PWR	Digital GPIO
10	DIO14	DIO	PWR	Digital GPIO
11	DIO15	DIO	PWR	Digital GPIO
12	DIO18	DIO	PWR	Digital GPIO
13	DIO19	DIO	PWR	Digital GPIO
14	DIO20	DIO	PWR	Digital GPIO
15	DIO21	DIO	PWR	Digital GPIO
16	VCCMOD	PWR	-	Power Input (1.71~3.8V)
17	GND	DIO	PWR	Ground
18	DIO22	DIO	PWR	Digital GPIO
19	DIO23	DIO	PWR	Digital GPIO
20	DIO24	DIO	PWR	Digital GPIO
21	DIO25	DIO	PWR	Digital GPIO
22	DIO00	DIO	PWR	Digital GPIO
23	DIO01	DIO	PWR	Digital GPIO
24	DIO02	DIO	PWR	Digital GPIO
25	DIO05	DIO	PWR	Digital GPIO
26	RESET	DIO	PWR	RESET
27	GND	GND	GND	Ground

Table2: Pin Definition

4、Electrical Characteristics

4.1 Absolute Maximum Ratings

The absolute maximum ratings provided in this section reflect the stress levels that, if exceeded, may cause permanent damage to the device. No functionality is guaranteed outside the operating specifications. Functionality and reliability are only guaranteed within the operating.

Parameter	Min	Typ	Max	Unit
Supply voltage (VDDS)	-0.3	-	4.1	V
Maximum Junction Temperature	-40	-	125	°C
Storage Temperature	-40	-	150	°C

Table 3: Absolute Maximum Ratings

4.2 Recommended Operating Conditions

Rating	Min	Typ	Max	Unit
Operating ambient temperature	-40	-	85	° C
Supply Voltage(VCC)	1.71	3.3	3.8	V
I/O supply Voltage	1.8	-	VDD_BAT	V
Frequency range	2360	-	2510	MHz

Table 4: Recommended Operating Conditions

4.3 Power Consumption

The current consumption measurements are taken with a 3.3V supply at 25 ° C of ambient temperature at the RF port. All transmitters' measurements are based on 100% duty cycle.

Work Mode	Description		Peak(mA)
Active (RF working)	RX		5.3mA
	TX	TX Power:0dBm	5.1mA
		TX Power:+7dBm	<11.0mA

Table5: Active Mode Power Consumption

Minimum power consumption：Condition: VCC=3.3V, ambient temperature:25℃

Parameter	32kHz RCOSC	Retention SRAM	Wake-up	Current Consumption (Typical)
Power Down	Off	Off	Wake-up by GPIO	150nA
Sleep Mode	On	Retention	Wake-up by GPIO,Timer	710nA

Table7: Low Power Mode Power Consumption

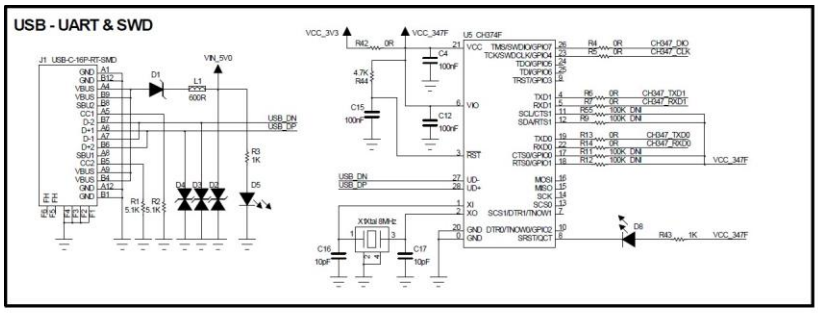
4.4 Radio Performance

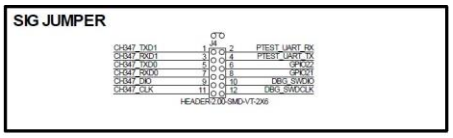
Parameter	Bandwidth	Modulation	Rate	Type	Unit
Tx Power	2MHz	GFSK	1Mbps	+7	dBm
			2Mbps	+7	dBm
Rx Sensitivity			1Mbps	-96.5	dBm
			2Mbps	-92	dBm

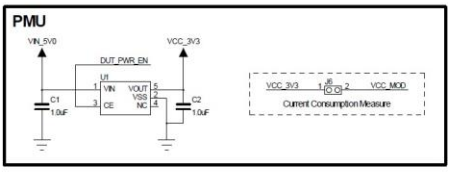
Table8: BLE Radio Characteristics

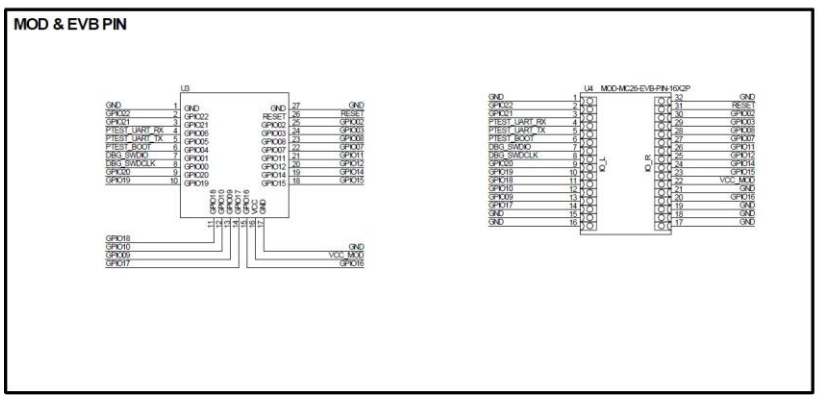
5、Peripheral Schematics

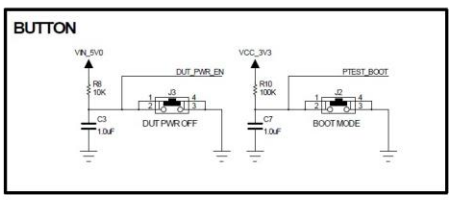
This is the typical application circuit of the module connected with peripheral components (for example, power supply, antenna, reset button, and UART interface).

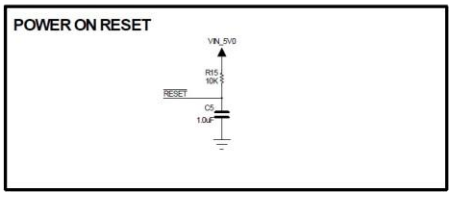












6、Mechanical Specification

6.1 Dimensional View

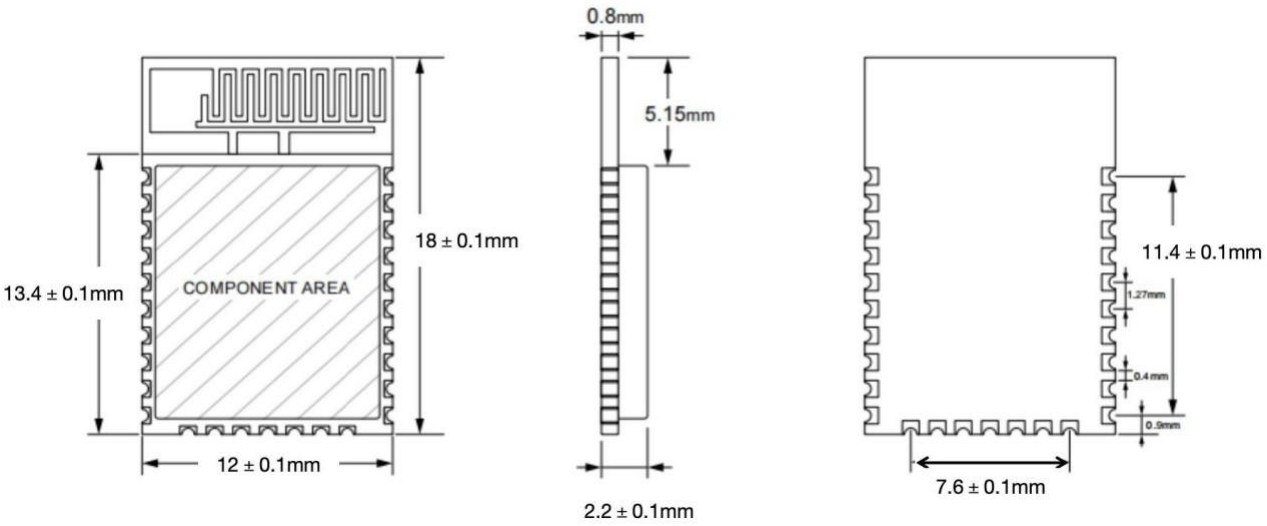


Figure 4：EH-MC23 Physical Dimensions

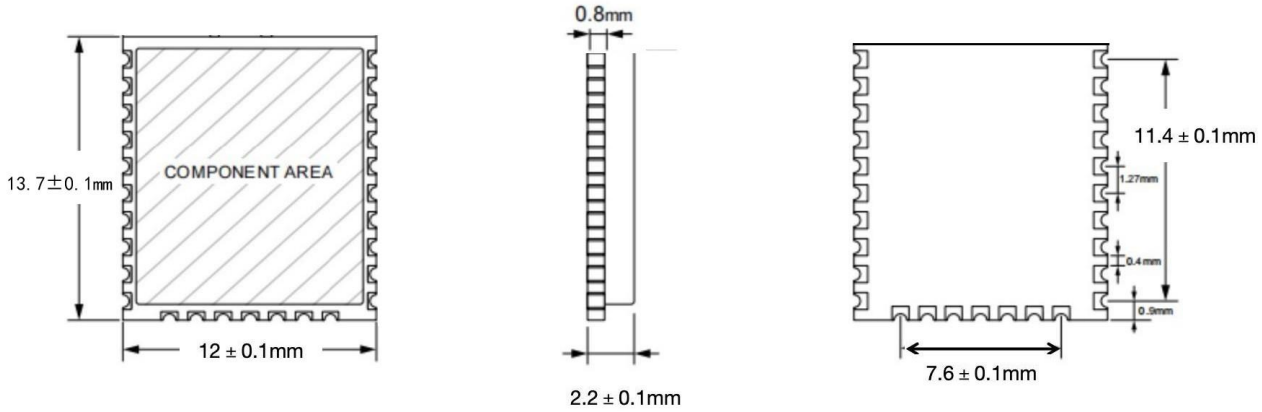


Figure 5：EH-MC23B Physical Dimensions

6.2 Recommended PCB Land Pattern

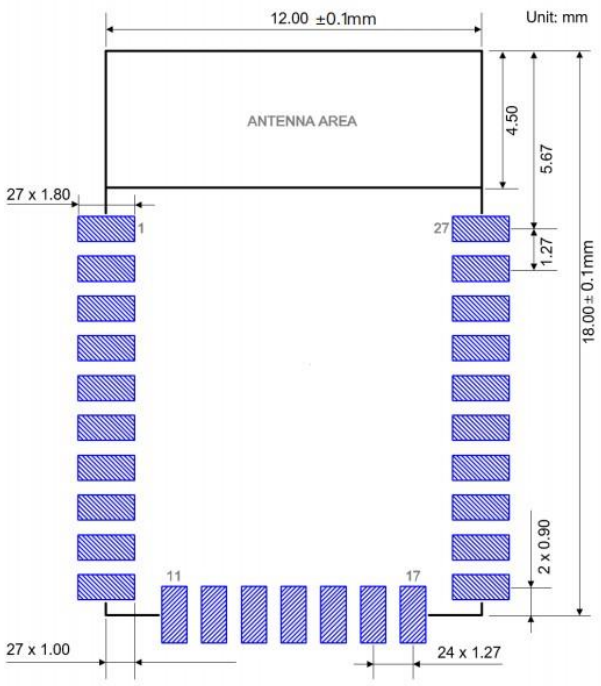


Figure 6：EH-MC23 Recommended PCB Land Pattern

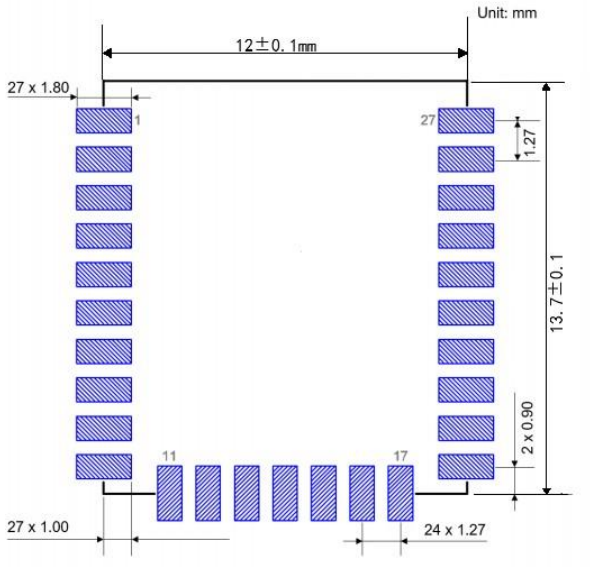


Figure 7：EH-MC23B Recommended PCB Land Pattern

7、Development Kit

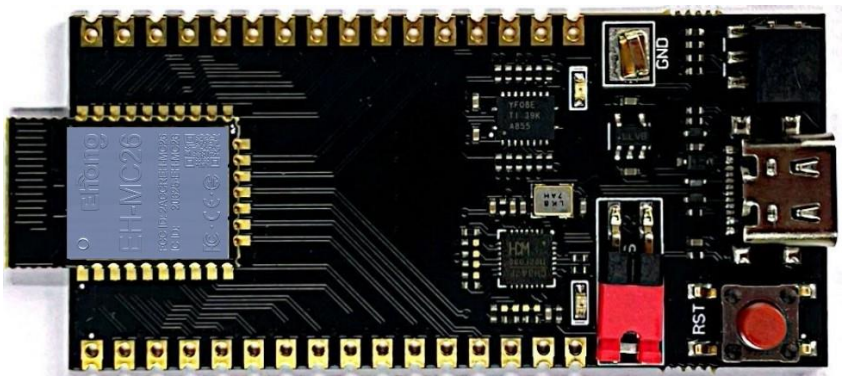


Figure 8：EH-MC23 Development Kit

The EH-MC23-EVK development board supports three colors led, key functions and comes with a serial chip to meet customers' basic development and verification needs. The EH-MC26-EVK also uses 2.54 standard pins to lead the module's universal iO and five-way dip switches, making it easy for customers to use and improving secondary development efficiency.

8、Product Handling

8.1 Storage Conditions

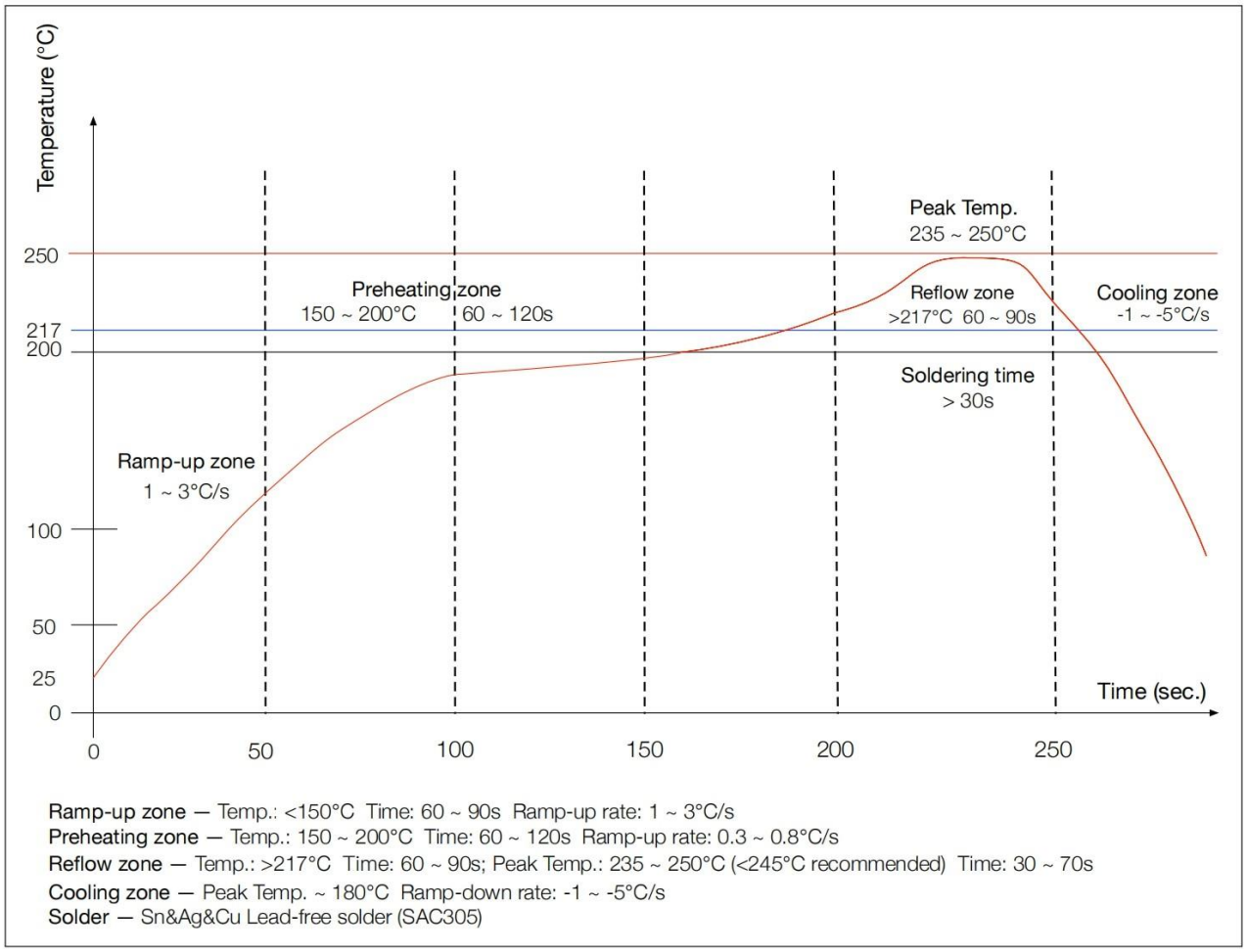
- The products sealed in moisture barrier bags (MBB) should be stored in a non-condensing atmospheric environment of < 40 ° C and /90%RH. The module is rated at the moisture sensitivity level (MSL) of 3.
- After unpacking, the module must be soldered within 168 hours with the factory conditions 25±5 ° C and /60%RH. If the above conditions are not met, the module needs to be baked.

8.2 Electrostatic Discharge (ESD)

- Human body model (HBM): ±2000 V
- Charged-device model (CDM): ±500 V)

8.3 Reflow Profile

Solder the module in a single reflow.



ultrasonic welders or ultrasonic cleaners. This vibration may induce resonance in the in-module crystal and lead to its malfunction or even failure. As a consequence, the module may stop working or its performance may deteriorate.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01 List of applicable FCC rules:
FCC Part 15 Subpart C 15.247 & 15.207 & 15.209

Specific operational use conditions:
The module is a Bluetooth module with BLE function. Operation Frequency: 2402-2480MHz Number of Channel: 40 Modulation: GFSK
Type: EH-MC23 Model PCB Antenna(2.5dBi)
EH-MC23B Model Pin Antenna(1.99dBi)
The module can be used for mobile applications with a maximum 2.5dBi antenna. The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Limited module procedures
Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

Trace antenna designs
Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

RF exposure considerations
The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and If RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Antennas
Antenna Specification are as follows: EH-MC23 (PCB Antenna) EH-MC23B (Pin Antenna)
This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna;
The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.
As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.)

Label and compliance information
Host product manufacturers need to provide a physical or e-label stating “Contains FCC ID: 2ACCRMC23” with their finished product.

Information on test modes and additional testing requirements
Operation Frequency: 2402-2480MHz Number of Channel: 40
Modulation: GFSK
Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.
Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

Additional testing, Part 15 Subpart B disclaimer
The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Federal Communication Commission Statement (FCC, U.S.)
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:
Reorient or relocate the receiving antenna.
Increase the separation between the equipment and receiver.
Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
FCC Caution:
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTES
Co-location warning:
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
OEM integration instructions:
This device is intended only for OEM integrators under the following conditions:
The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
End product labeling:
The final end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2ACCRMC23”.

Information that must be placed in the end user manual:
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

ISED Statement
English: This device complies with Innovation, Science and Economic Development license - exempt RSS standard(s).
Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the devi ce. The digital apparatus complies with Canadian CAN ICES - 3 (B)/NMB - 3(B).
French: Le présentappareilestconforme aux CNR d' Innovation, Science et développement économique applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareildoit accepter tout brouillageradioélectriquesubi, mêm esi le brouillageest susceptible d'encompromettre le fonctionnement.
This radio transmitter has been approved by Innovation, Science and Economic Development to operate with the antenna types listed with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
Le présent émetteur radio a été approuvé par Innovation, Science et développement économique pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Radiation Exposure Statement
This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
Déclaration d'exposition aux radiations
Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following condition:
The transmitter module may not be co-located with any other transmitter or antenna.
As long as the condition above is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.
Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes:
Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.
Tant que les 1 condition ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

Important Note:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.
Note Importante:
Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l' IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling
The final end product must be labeled in a visible area with the following: Contains IC: 20625-MC23. Plaque signalétique du produit final
Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC: 20625-MC23
Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual. Manuel d'information à l'utilisateur final
L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

This radio transmitter ISED Number: 20625-MC23 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that hava a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device

9、Related Documentation and Resources

9.1 Ehong Documents

Visit website and download:
https://www.ehonglink.com/h-pd-466.html

Supports：support@ehonglink.com

Sales： sales@ehonglink.com

Phone: +0086 021-64769993-201

9.2 Revision History

Data	Version	Release notes
2025-1	V1.0	Preliminary Release